REMARKS/ARGUMENTS

The undersigned thanks the Examiner for his thorough examination of the case, and for granting the Applicant a telephonic interview conducted on October 25, 2006. Pursuant to the agreement reached during the interview, the independent claims have been amended to incorporate the features of claim 50 and the additional limitation of "obtaining successive lines of each of said feature images and updating said window summation buffer." This amendment is made solely in order to expedite prosecution, and the Applicant maintains that the claims of the original scope are patentable over US Patent No. 5,179,441 (*Anderson et al.).* Accordingly, the Applicant reserves the right to pursue the claims of the original scope in a continuation application.

All independent claims have been amended to recite a combination of features that the Examiner agreed would be allowable over *Anderson et al.* It is respectfully submitted that all claims are now in condition for allowance. A brief summary of the telephonic interview is provided below for the Examiner's convenience. In addition, the Examiner's rejection is fully traversed below.

During the telephonic interview, the Applicant discussed the claimed invention and the methodology of *Anderson et al.* The general method described by *Anderson et al.* (see, for example, Figure 4 of *Anderson et al.*) correlates a rectangular block from one feature image (the reference image) with a set of similar blocks in another image. These correlation operations are performed for a block surrounding each pixel in the reference image, to produce a set of correlation images: one image for each offset. The correlation images are then searched along each pixel to find the minimum correlation response, which gives the depth of the scene at that pixel.

Typically, the correlation blocks surrounding each pixel are square, *e.g.*, 7x7 or 11x11 pixels. The correlation operation consists of subtracting corresponding pixels in each block, and then summing the square (SSD) or absolute value (SAD) of the differences. The computational cost of each correlation is therefore proportional to the area of the block; if A is the area, the cost is kA, for some small factor k. The total number of such correlations is P x D, where P is the total number of pixels in the image, and D is the number of search places that are chosen. Thus, an

implementation of the method of *Anderson et al.* would involve P x D x kA calculations. This constitutes a very large computation, and in this naive form is inefficient and potentially intractable for real-time computation with standard computers.

In contrast, the Applicant's invention (as recited, for example, in claim 49) significantly reduces the number of computation steps, by the novel approach of caching useful intermediate computations performed during the correlation operations. These results can be held in several buffers, the chief one being the window summation buffer. Using these buffers, an incremental method of calculating the block correlations can be achieved that involves just six (6) subtraction and summation operations, independent of the size of the correlation block. Thus, the number of operations to compute the result is reduced to P x D x <u>*6k*</u>, an order of magnitude improvement over conventional methods such as that taught by *Anderson et al.* involving P x D x <u>*kA*</u> operations as described above.

A further advantage of the Applicant's invention is incremental computation, wherein the method computes a new line of the result as each new line of the feature images becomes available. The key to this approach is the compact representation of intermediate stages of the computation stored in the window summation buffer.

In contrast, the methodology of *Anderson et al.* first computes the full feature images, then computes a new set of images by shifting, then performs correlations to compute a new set of D correlation images, and then finally reduces these to form a result image. Each of the intermediate steps necessarily involvesstoraging full-sized intermediate images. This significant inefficiency is remedied by the Applicant's invention, which keeps only the small buffer of intermediate results necessary to incrementally compute a new line of the result from each new line of the feature images.

In the Office Action, the Examiner has rejected claims 49-68 under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5,179,441 (*Anderson et al.*). The Examiner's rejection is fully traversed below.

In the Office Action, the Examiner concedes that *Anderson et al.* does not teach: "obtaining a line from each feature image" (claim 49). Claim 49 further recites: "computing a correlation of <u>two lines</u>," and "storing the result of the <u>correlation</u> in the window summation buffer" (emphasis added) in order to perform area correlation on the first and second feature images. As *Anderson et al.* fails to teach obtaining a line from each feature image, the reference also therefore fails to teach computing the correlation of <u>the two lines</u>, and storing the <u>result</u> of the correlation in a window summation buffer in order to perform correlation on feature images, as positively claimed by the Applicant.

In the Office Action, the Examiner asserts that *Anderson et al.* teaches or suggests "obtaining a line from each feature image," and consequently teaches or suggests computing the correlation of the two lines and storing the result in a window buffer. To support this assertion, the Examiner has relied on a section of *Anderson et al.* which is reproduced below for the Examiner's convenience.

> Prior probabilistic models models can be classified according to whether the disparity field is modelled as totally uncorrelated (0-D modelling), correlated in one dimension, say within scanlines (1-D), or correlated in both dimensions. The degree of correlation affects the difficulty of the estimation problem. The present invention makes use of the uncorrelated and one-dimensional cases. In the uncorrelated case, posterior probabilities can be derived that provide valuable confidence estimates and may be useful for performance evaluation purposes. [*Anderson et al.*, Col. 7, lines 41-52]

The general knowledge that a disparity field can be classified in the context of <u>probability models</u> in one dimension within scanlines (1-D) does not teach or even remotely suggest "obtaining a line from each feature image" and computing a correlation for the lines in the context of performing area correlation on first and second feature images. Accordingly, it is respectfully submitted that the Examiner's rejection is improper.

Other independent claims recite similar features as recited in claim 49 and are patentable over *Anderson et al.* for at least the same reasons. Moreover, other independent claims recite further additional features that are not taught or suggested by *Anderson et al*. For example, claim 54 recites: "a first buffer capable of storing

more than Y but less than 3Y lines of the first feature image," and "a second buffer capable of storing more than Y but less than 3Y lines of the second feature image."

Based on the foregoing, it is submitted that the claims are patentably distinct over the cited art of record. Additional limitations recited in the independent claims or the dependent claims are not further discussed because the limitations discussed above are sufficient to distinguish the claimed invention from the cited art. Accordingly, Applicant believes that all pending claims are allowable and respectfully requests a Notice of Allowance for this application from the Examiner.

Applicants hereby petition for any extension of time which may be required to maintain the pendency of this case, and any required fee for such extension or any further fee required in connection with the filing of this Amendment is to be charged to Deposit Account No. 500388 (Order No. SRI1P023C1D1). Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at the telephone number set out below.

Respectfully submitted,
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